## CLAIMS

1. A transfer film for laser micro-capture of a sample comprising:

at least one expansion layer, and

an adhesive layer coupled to the expansion layer; the adhesive layer being located between the expansion layer and a sample for microdissection; the expansion layer being adapted to absorb energy incident upon the transfer film and to expand to exert a force upon the adhesive layer such that a selected portion of the sample adheres to the adhesive layer for microdissection.

2. The transfer film of claim 1 wherein the expansion layer is thermally coupled to at least one energy-absorbing substance.

3. The transfer film of claim 2 wherein the adhesive layer is thermally coupled to at least one energy-absorbing substance.

4. The transfer film of claim 3 wherein the expansion layer and the adhesive layer are doped with at least one independently addressable energy absorbing substance.

5. The transfer film of claim 3 wherein the expansion layer and the adhesive layer are doped with at least one spectrally selective energy-absorbing substance.

6. The transfer film of claim 3 wherein the expansion layer and the adhesive layer are doped with at least one independently addressable, spectrally selective energy-absorbing substance.

7. The transfer film of claim 2 wherein the at least one energy-absorbing substance is selected from the group consisting of an energy-absorbing dye, a metal film, a polymer nano-composite, and Buckminsterfullerene.

8. The transfer film of claim 7 wherein the energy-absorbing dye is a spectrally selective dye.

9. The transfer film of claim 2 wherein the expansion layer is doped with the at least one energy-absorbing substance such that at least one concentration gradient is formed.

10. The transfer film of claim 9 wherein the expansion layer includes a first surface and a second surface; the first surface being located distally from the adhesive layer relative to the second surface; the second surface being located proximately to the adhesive layer relative to the first surface.

11. The transfer film of claim 10 wherein the expansion layer at the first surface is doped with at least one energy-absorbing substance and the expansion layer at the second surface is not doped.

12. The transfer film of claim 10 wherein the expansion layer at the second surface is doped with at least one energy-absorbing substance and the expansion layer at the first surface is not doped.

13. The transfer film of claim 10 wherein the expansion layer is doped at the first surface and the second surface with the at least one energy-absorbing substance.

14. The transfer film of claim 13 wherein the expansion layer is doped at the first surface and the second surface with at least one independently addressable energy-absorbing substance.

15. The transfer film of claim 13 wherein the expansion layer is doped at the first surface and at the second surface with at least one spectrally selective energy-absorbing substance.

16. The transfer film of claim 13 wherein the expansion layer is doped at the first surface and at the second surface with at least one independently addressable, spectrally selective energy-absorbing substance.

17. The transfer film of claim 13 wherein the expansion layer is doped at the first surface and the second surface with the same energy-absorbing substance.

18. The transfer film of claim 17 wherein the expansion layer is doped with the same concentration of the energy-absorbing substance.

19. The transfer film of claim 1 wherein the adhesive layer includes at least one tackifying agent.

20. The transfer film of claim 1 wherein the adhesive layer includes at least one pressure sensitive adhesive.

21. The transfer film of claim 1 wherein the adhesive layer is thermally coupled to at least one energy-absorbing substance.

22. The transfer film of claim 21 wherein the at least one energy-absorbing substance is selected from the group consisting of an energy-absorbing dye, a metal film, a polymer nanocomposite, and Buckminsterfullerene.

23. The transfer film of claim 22 wherein the energy-absorbing dye is a spectrally selective dye.

24. The transfer film of claim 21 wherein the adhesive layer is doped with the at least one energy absorbing substance such that at least one concentration gradient is formed.

25. The transfer film of claim 24 wherein the adhesive layer includes a first surface and a second surface; the first surface being located proximately to the expansion layer relative to the second surface; the second surface being located distally to the expansion layer relative to the first surface.

26. The transfer film of claim 25 wherein the adhesive layer is doped at the first surface with the at least one energy-absorbing substance and the adhesive layer at the second surface is not doped.

27. The transfer film of claim 25 wherein the adhesive layer is doped at the second surface with the energy absorbing substance and the adhesive layer at the first surface is not doped.

28. The transfer film of claim 25 wherein the adhesive layer is doped at both the first surface and the second surface with the at least one energy-absorbing substance.

29. The transfer film of claim 28 wherein the expansion layer is doped at the first surface and the second surface with at least one independently addressable energy-absorbing substance.

30. The transfer film of claim 28 wherein the expansion layer is doped at the first surface and at the second surface with at least one spectrally selective energy-absorbing substance.

31. The transfer film of claim 28 wherein the expansion layer is doped at the first surface and at the second surface with at least one independently addressable, spectrally selective energy-absorbing substance.

32. The transfer film of claim 28 wherein the adhesive layer is doped at both the first surface and the second surface with the same energy-absorbing substance.

33. The transfer film of claim 28 wherein the adhesive layer is doped with the same concentration of the energy-absorbing substance.

34. The transfer film of claim 1 wherein a softening point of the adhesive layer is lower than a softening point of the expansion layer.

35. The transfer film of claim 1 wherein a softening point of the adhesive layer is higher than the softening point of the expansion layer.

36. The transfer film of claim 1 wherein the expansion layer includes at least one thermoplastic polymer and the adhesive layer includes at least one thermoplastic polymer.

37. A transfer film for laser micro-capture of a sample comprising:

at least one expansion layer, and

at least one adhesive layer coupled to the expansion layer, the adhesive layer being located between the expansion layer and a sample for microdissection; the expansion layer being adapted to absorb energy incident upon the transfer film and to expand to exert a force upon the adhesive layer such that the adhesive layer is deflected towards the sample and adheres to a selected portion of the sample; the adhesive layer being adapted to retract away from the sample.

38. The transfer film of claim 37 wherein the expansion layer is thermally coupled to at least one energy-absorbing substance.

39. The transfer film of claim 37 wherein the expansion layer is doped with at least one independently addressable energy-absorbing substance.

40. The transfer film of claim 37 wherein the expansion layer is doped with at least one spectrally selective energy-absorbing substance.

41. The transfer film of claim 37 wherein the expansion layer is doped with at least one independently addressable, spectrally selective energy-absorbing substance.

42. The transfer film of claim 38 wherein the at least one energy-absorbing substance is selected from the group consisting of an energy-absorbing dye, a metal film, a polyer nanocomposite, and Buckminsterfullerene.

43. The transfer film of claim 42 wherein the energy-absorbing dye is a spectrally selective dye.

44. The transfer film of claim 38 wherein the expansion layer is doped with the at least one energy-absorbing substance such that at least one concentration gradient is formed.

45. The transfer film of claim 44 wherein the expansion layer includes a first surface and a second surface; the first surface being located distally from the adhesive layer relative to the second surface; the second surface being located proximately to the adhesive layer relative to the first surface.

46. The transfer film of claim 45 wherein the expansion layer at the first surface is doped with at least one energy-absorbing substance and the expansion layer at the second surface is not doped.

47. The transfer film of claim 45 wherein the expansion layer at the second surface is doped with at least one energy-absorbing substance and the expansion layer at the first surface is not doped.

48. The transfer film of claim 45 wherein the expansion layer is doped at the first surface and the second surface with the at least one energy-absorbing substance.

49. The transfer film of claim 48 wherein the expansion layer is doped at the first surface and the second surface with at least one independently addressable energy-absorbing substance.

50. The transfer film of claim 48 wherein the expansion layer is doped at the first surface and at the second surface with at least one spectrally selective energy-absorbing substance.

51. The transfer film of claim 48 wherein the expansion layer is doped at the first surface and at the second surface with at least one independently addressable, spectrally selective energy-absorbing substance.

52. The transfer film of claim 48 wherein the expansion layer is doped at the first surface and the second surface with the same energy-absorbing substance.

53. The transfer film of claim 52 wherein the expansion layer is doped with the same concentration of the energy-absorbing substance.

54. The transfer film of claim 37 wherein the adhesive layer includes at least one tackifying agent.

55. The transfer film of claim 37 wherein the adhesive layer includes at least one pressure sensitive adhesive.

56. The transfer film of claim 37 wherein a softening point of the adhesive layer is lower than a softening point of the expansion layer.

57. The transfer film of claim 37 wherein a softening point of the adhesive layer is higher than the softening point of the expansion layer.

58. The transfer film of claim 37 wherein the expansion layer includes at least one thermoplastic polymer and the adhesive layer includes at least one thermoplastic polymer.

59. A transfer film for laser micro-capture of a sample comprising:
at least one expansion layer,

at least one retraction layer coupled to the expansion layer, and

an adhesive layer coupled to the retraction layer, the adhesive layer being located between the retraction layer and a sample for microdissection, the retraction layer being located between the expansion layer and the adhesive layer, the expansion layer absorbing energy incident upon the transfer film and expanding to exert a force upon the retraction layer and adhesive layer such that the retraction layer and the adhesive layer are deflected towards the sample such that a selected portion of the sample adheres to the adhesive layer for microdissection and the retraction layer with the attached adhesive layer retracts away from the sample.

60. The transfer film of claim 59 wherein the expansion layer is thermally coupled to at least one energy-absorbing substance.

61. The transfer film of claim 60 wherein the adhesive layer is thermally coupled to at least one energy-absorbing substance.

62. The transfer film of claim 61 wherein the expansion layer and the adhesive layer are doped with at least one independently addressable energy absorbing substance.

63. The transfer film of claim 61 wherein the expansion layer and the adhesive layer are doped with at least one spectrally selective energy-absorbing substance.

64. The transfer film of claim 61 wherein the expansion layer and the adhesive layer are doped with at least one independently addressable, spectrally selective energy-absorbing substance.

65. The transfer film of claim 60 wherein the at least one energy-absorbing substance is selected from the group consisting of an energy-absorbing dye, a metal film, a polymer nanocomposite, and Buckminsterfullerene.

66. The transfer film of claim 65 wherein the energy-absorbing dye is a spectrally selective dye.

67. The transfer film of claim 60 wherein the expansion layer is doped with the at least one energy-absorbing substance such that at least one concentration gradient is formed.

68. The transfer film of claim 67 wherein the expansion layer includes a first surface and a second surface; the first surface being located distally from the adhesive layer relative to the second surface; the second surface being located proximately to the adhesive layer relative to the first surface.

69. The transfer film of claim 68 wherein the expansion layer at the first surface is doped with at least one energy-absorbing substance and the expansion layer at the second surface is not doped.

70. The transfer film of claim 68 wherein the expansion layer at the second surface is doped with at least one energy-absorbing substance and the expansion layer at the first surface is not doped.

71. The transfer film of claim 68 wherein the expansion layer is doped at the first surface and the second surface with the at least one energy-absorbing substance.

72. The transfer film of claim 71 wherein the expansion layer is doped at the first surface and the second surface with at least one independently addressable energy-absorbing substance.

73. The transfer film of claim 71 wherein the expansion layer is doped at the first surface and at the second surface with at least one spectrally selective energy-absorbing substance.

74. The transfer film of claim 71 wherein the expansion layer is doped at the first surface and at the second surface with at least one independently addressable, spectrally selective energy-absorbing substance.

75. The transfer film of claim 71 wherein the expansion layer is doped at the first surface and the second surface with the same energy-absorbing substance.

76. The transfer film of claim 75 wherein the expansion layer is doped with the same concentration of the energy-absorbing substance.

77. The transfer film of claim 59 wherein the adhesive layer includes at least one tackifying agent.

78. The transfer film of claim 59 wherein the adhesive layer includes at least one pressure sensitive adhesive.

79. The transfer film of claim 59 wherein the adhesive layer is thermally coupled to at least one energy-absorbing substance.

80. The transfer film of claim 79 wherein the at least one energy-absorbing substance is selected from the group consisting of an energy-absorbing dye, a metal film, a polymer nanocomposite, and Buckminsterfullerene.

81. The transfer film of claim 80 wherein the energy-absorbing dye is a spectrally selective dye.

82. The transfer film of claim 79 wherein the adhesive layer is doped with the at least one energy absorbing substance such that at least one concentration gradient is formed.

83. The transfer film of claim 82 wherein the adhesive layer includes a first surface and a second surface; the first surface being located proximately to the expansion layer relative to the second surface; the second surface being located distally to the expansion layer relative to the first surface.

84. The transfer film of claim 83 wherein the adhesive layer is doped at the first surface with the at least one energy-absorbing substance and the adhesive layer at the second surface is not doped.

85. The transfer film of claim 83 wherein the adhesive layer is doped at the second surface with the energy absorbing substance and the adhesive layer at the first surface is not doped.

86. The transfer film of claim 83 wherein the adhesive layer is doped at both the first surface and the second surface with the at least one energy-absorbing substance.

87. The transfer film of claim 86 wherein the expansion layer is doped at the first surface and the second surface with at least one independently addressable energy-absorbing substance.

88. The transfer film of claim 86 wherein the expansion layer is doped at the first surface and at the second surface with at least one spectrally selective energy-absorbing substance.

89. The transfer film of claim 86 wherein the expansion layer is doped at the first surface and at the second surface with at least one independently addressable, spectrally selective energy-absorbing substance.

90. The transfer film of claim 86 wherein the adhesive layer is doped at both the first surface and the second surface with the same energy-absorbing substance.

91. The transfer film of claim 86 wherein the adhesive layer is doped with the same concentration of the energy-absorbing substance.

92. The transfer film of claim 59 wherein a softening point of the adhesive layer is lower than a softening point of the expansion layer.

93. The transfer film of claim 59 wherein a softening point of the adhesive layer is higher than the softening point of the expansion layer.

94. The transfer film of claim 59 wherein the softening point of the expansion layer is lower than the softening point of the retraction layer.

95. The transfer film of claim 59 wherein the expansion layer includes at least one thermoplastic polymer and the adhesive layer includes at least one thermoplastic polymer; and the retraction layer includes at least one thermoplastic polymer.

96. A transfer film for laser micro-capture of a sample comprising:

a first layer thermally coupled to a first energy-absorbing substance selected to absorb energy within a first spectrum;

a second layer coupled to the first layer such that second layer is proximally located to a sample for micro-capture relative to the first layer; the second layer being thermally coupled to second energy-absorbing substance selected to absorb energy within a second spectrum;

wherein the first layer provides a first expansion upon activation by at least a first laser pulse of energy within the first spectrum to exert a force on the second layer such that a portion of the second layer is moved towards the sample at least a first distance; the second layer providing a second expansion upon activation by at least a second laser pulse of energy within the second spectrum such that the portion of the second layer moves towards the sample a second distance.

97. The transfer film of claim 96 wherein the transfer film is adapted for non-contact laser micro-capture.

98. The transfer film of claim 96 wherein the first and second energy-absorbing substance is selected from the group consisting of an energy-absorbing dye, a metal film, a polymer nanocomposite, and Buckminsterfullerene.

99. The transfer film of claim 96 wherein the first spectrum does not include the second spectrum.

100. The transfer film of claim 96 wherein the first spectrum and the second spectrum each include at least one wavelength.

101. The transfer film of claim 96 wherein the second expansion temporally follows the first expansion.

102. The transfer film of claim 99 wherein the second layer contacts the sample during the second expansion

103. The transfer film of claim 96 wherein the first expansion temporally follows the second expansion.

104. The transfer film of claim 101 wherein the second layer contacts the sample during the first expansion.